

## AMENDMENTS TO THE SPECIFICATION

### **DEVICE FOR THE TARGETED, CONTROLLABLE DELIVERY OR DRAWING OF A LIQUID OR VISCOUS SUBSTANCE**

#### BACKGROUND OF THE INVENTION

**[0001]** The invention relates to a device for the targeted, controllable delivery or drawing of a liquid or viscous substance ~~according to the~~ using a piston and reservoir. ~~preamble of Claim 1.~~ A device of this type is known from European Patent ~~Document~~ EP 0 598 867 B1 (Wyssmann). The delivery of small, particularly comparatively valuable liquid or viscous substances according to a previously defined time schedule ~~which has to~~ must be precisely observed. ~~An,~~ by means of an automatic autonomous control of the program flow – essentially without any intervention from the outside – is carried out particularly by ~~means of~~ devices known in principle from the above-mentioned European Patent ~~Document~~ EP 0 598 867 B1 of the same type.

**[0002]** Further state of the art is illustrated in German Patent ~~Documents~~ DE 195 22 451 A1, DE 35 32 335 A1, DE 92 02 740 U1, European Patent ~~Documents~~ 05 98 867 B1, EP 0 362 328 B1 (two-layer construction, transparent plastic material with a gas-tight metal coating which, however, is not transparent) and European Patent ~~Document~~ EP 0343 157 B1.

**[0003]** Suitable gas generating cells for such devices are described, for example, in German Patent ~~Document~~ DE 35 32 335 A1 (Winsel) or European Patent ~~Document~~ EP 0 343 157 B1 (Winsel). A corresponding device which can be used for the injection or infusion of a pharmaceutical solution is described in European Patent ~~Document~~ EP 0 278 954 B1 (Winsel).

**[0004]** The devices of the above-mentioned type have been successful per se. They also exist as suction devices (sample collecting devices, etc.).

**[0005]** However, the losses, which occur particularly at higher counterpressures and/or temperatures and/or longer running times and cannot be calculated in a sufficiently precise manner, present problems because of the diffusion of the gas generated by the gas generating cell for driving the piston for the discharge of the liquid or viscous substance from the reservoir.

#### SUMMARY OF THE INVENTION

It is an object of the invention to solve this problem.

——The invention solves this task by means of the object of the claims. Claim 1.

——Advantageous embodiments are contained in the ~~sub~~claims dependent claims.

**[0006]** It is particularly advantageous for the wall of the reservoir to be constructed in three layers at least in sections. It ~~preferably~~ consists of transparent, and translucent layers such that the filling level always remains visible. In contrast to a barrier layer made of metal, the entire cylinder jacket can therefore have a translucent construction.

**[0007]** In this case, it is useful for the inner and outer layer of the three-layer construction to consist of a ~~preferably~~ transparent plastic material, the center layer between the two ~~preferably~~ transparent plastic layers consisting of a material, particularly a solid material or a liquid which is also ~~preferably~~ transparent and has a low diffusion coefficient for the gas generated by the gas generating cell and delivered into the pressure chamber.

**[0008]** ~~Particularly preferably, the~~The outer and inner layers may consist of transparent Polyethylene Terephthalate (“PET”). Also ~~preferably~~, the center barrier layer may ~~consiste~~nsists particularly of a transparent polyamide, which can even be processed as a solid layer and ~~preferably~~ has a thickness of 30-60%. Better results are achieved when the center barrier layer is a solid layer with a thickness of 40-50% of the entire wall. Even better results are achieved when the center barrier layer is a solid layer with a thickness of, particularly preferably, 45% of the entire wall. Particularly good results are achieved in this manner, and a particularly good compromise is implemented between a good sealing and a stable design. As an alternative, Ethyene Vinyl Alcohol Polymer (“EVOH”) can also be used as a barrier layer.

**[0009]** Such an arrangement can be produced by a modern plastic injection process (co-injection or multi-material molding). It is expedient, for example, to use a gas barrier material, such as EVOH.

**[00010]** A special field of application involves lubricant input devices, in the case of which the gas generated by the gas generating cell and used for advancing the piston is hydrogen. The material is also useful for implementing corresponding suction devices.

**[00011]** Additional features, which alone or in combination with any other feature(s), such as those listed above may comprise patentable subject matter and will become apparent to those skilled in the art upon consideration of the following detailed description of various embodiments exemplifying the best mode of carrying out the embodiments as presently perceived.

### BRIEF DESCRIPTION OF THE DRAWINGS

[00012] In the following, the invention will be described in detail by means of an embodiment with reference to the drawing.

[00013] Figure 1 is a schematic view of a device according to the invention;

[00014] Figure 2 is an enlarged representation of the housing wall of the device from Figure 1;

[00015] Figure 3 is a view of a detail of another device.

### DETAILED DESCRIPTION OF THE DRAWINGS

Figure 1 illustrates a ~~preferably~~ cylindrical reservoir 7 in which a piston 6 is displaceably guided.

—The piston 6 divides the reservoir 7 into a pressure chamber 2 as well as a storage chamber 1 for viscous substances, particularly lubricants.

[00016] At one of its axial ends, —on one side of the piston 6 on which the lubricant 1 is received in the storage chamber 1—, the reservoir 7 has an discharge opening 8 and, at its opposite axial end, which is oriented toward the pressure chamber 2, it has an insert 9 in which at least one gas generating cell 3 as well as an electric circuit 5 and a device for controlling the running time (rotary switch or the like), which is not visible here, are accommodated.

[00017] At least one passage opening 10 between the gas generating cell 3 and the pressure chamber 2 permits the passage of gas, which is supplied by the gas generating cell, into the pressure chamber 2. Depending on the adjustment of the running time control, —see the above-mentioned state of the art in this respect—, the generating of gas, particularly hydrogen, now takes place, so that the piston 6 is moved by the gas generating cell and pushes the lubricant 1 out of the discharge opening 8.

[00018] As illustrated in Figure 2, the wall 4 of the reservoir 7 has a multi-layer construction at least in sections, but preferably completely. In this case, it is useful to select a three-layer construction with inner and outer layers 4a, 4c produced of a transparent plastic material and, to construct a barrier layer 4b between these, particularly of a liquid material permitting only a very slight diffusion of gas, particularly hydrogen.

[00019] In this manner, not only the loss of gas, particularly of hydrogen at a high counterpressure at the discharge opening, is clearly reduced, but the precision of the delivery of the viscous substance from the device is also increased, particularly at higher pressures or longer delivery times. Thus, it is, for example, conceivable to precisely deliver lubricants by means of the device according to the invention also for time periods of up to one year or more

and to still satisfactorily operate the device even at counterpressures of over 5 bar. An analogous situation applies to increased temperatures which may also result in a higher pressure.

According to an embodiment of the invention, a closing device 12, which can be detached, particularly broken off by way of a predetermined breaking point, is molded onto the discharge opening 8. As shown in Figure 3, the breaking point is 11.

———This idea improves the removal of the molded-on closing ~~pin-device~~ at the funnel to the lubricant output device.

**[00020]** ~~Function:~~ Thus, the closing ~~pin-device~~ can be twisted off by means of a standard tool (key, pliers). This causes no brows projecting into the pipe cross-section as a result of the specific shaping and the rotating movement.

**[00021]** Although the device for the targeted, controllable delivery or drawing of a liquid or viscous substance has been described in detail with reference to a certain illustrative embodiment, variations and modifications exist within the scope and spirit of this disclosure as described and defined in the following claims.

Reference Numbers:

Lubricant	1
Pressure chamber	2
Gas generating cell	3
Wall	4
Electronic circuit	5
Piston	6
Reservoir	7
Outer layer	7a, 7e
Barrier layer	7b
Discharge opening	8
Insert	9
Passage opening	10
Predetermined breaking point	11
Closing device	12